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EL PASO METROPOLITAN AREA
AIR POLLUTANT EMISSION INVENTORY

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A summary is presented of the emission inventory for the El Paso Metropolitan Area. The report provides estimates of the present levels of air pollutant emissions and status of their control. The pollutants which include sulfur oxides, particulates, carbon monoxide, hydrocarbons, and nitrogen oxides are delineated with respect to source type, season of the year, and geographical distribution within the area. The Study Area consists of 7 counties. A grid coordinate system was used to show the geographical distribution of emissions within counties. All sources of emissions were classified into five categories: transportation, stationary fuel combustion, solid waste disposal, industrial processes, and evaporative losses.

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1. El Paso City-County Health Unit, Air Pollution Section
2. New Mexico Air Pollution Control Program
3. Texas State Department of Health, Division of Air Pollution, Occupational and Radiological Health

PREFACE

This report, which presents the emission inventory for the El Paso Area, is another in a series of surveys outlining the sources and emissions of air pollutants for major metropolitan areas in the country. These surveys, conducted by the National Inventory of Air Pollutant Emissions and Control Branch of the National Air Pollution Control Administration, provide estimates of the present levels of air pollutant emissions and status of their control. The pollutants, which include sulfur oxides, particulates, carbon monoxide, hydrocarbons, and nitrogen oxides, are delineated with respect to source type, season of the year and geographical distribution within the area. The general procedure for the surveys is based upon the rapid survey technique for estimating air pollutant emissions.[1] These reports are intended to serve as aids in the proposing of boundaries of Air Quality Control Regions, as directed by the Air Quality Act of 1967.

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INTRODUCTION

This report is a summary of the El Paso air pollutant emission inventory conducted in March 1970. Since all inventories are based upon a calendar year, the data and emission estimates presented are representative of 1969 and should be considered as indicating the conditions as existed during that year.

The Study Area, which was chosen on the basis of the distribution of population and air pollution sources, consists of 7 counties. This area covers approximately 27,000 square miles and had a 1969 population of 554,800.

A grid coordinate system was used to show the geographical distribution of emissions within counties. The Study Area was subdivided into 49 grid zones ranging in size from 100 square kilometers in the heavily populated and industrialized areas to 6,400 square kilometers in the rural areas.

All sources of emissions were classified into five categories--transportation, stationary fuel combustion, solid-waste disposal, industrial processes and evaporative losses. Each of these source categories was divided into two subgroups--point sources and area sources. Facilities, which emit large quantities of air pollutants, were considered individually as point sources, while the many remaining contributors such as motor vehicles, residential and commercial fuel users, small industries and on-site refuse burning equipment, were considered collectively as area sources. For this report, thirty-two individual sources, which had emissions greater than 0.1 tons per average annual day for any pollutant, were classified as point sources.

Emissions were estimated by using various indicators such as fuel consumption, refuse burning rates, vehicle-miles, production data, and control efficiencies and emission factors relating these indicators to emission rates.[2] These factors represent average emission rates for a particular source category. Since individual sources have inherent differences that cannot always be taken into consideration, discrepancies between

the actual and estimated emissions are more likely in individual sources than in the total emissions for a source category.

As in all emission surveys, the data presented are estimates and should not be interpreted as absolute values. The estimates are, in some cases, partial totals due to the lack of emission factors and production or consumption data. Despite these limitations, these estimates are of sufficient accuracy and validity in defining the extent and distribution of air pollutant emissions in the Study Area.

SUMMARY

The annual emissions as estimated by the El Paso Area Air Pollutant Emission Inventory are:

Sulfur oxides	359,300 tons
Particulates	31,900 tons
Carbon Monoxide	344,400 tons
Hydrocarbons	43,000 tons
Nitrogen oxides	6,600 tons

The following is a brief description of the air pollutant emissions as presented in Table 1 and Table 2.

Sulfur Oxides: Most of the sulfur oxides emitted in the Study Area came from two individual sources. Both sources were copper smelters smelting ore containing large amounts of sulfur. These two smelters emitted approximately 97 percent of the total sulfur oxides.

Particulates: A foundry and a quarry emitted approximately 38 and 30 percent of the total particulates respectively. An additional 17 percent is emitted by the remaining process point sources.

Carbon Monoxide: Motor vehicles contributed 63 percent of the carbon monoxide emitted annually. Other sources included two refineries that together accounted for approximately 29 percent.

Hydrocarbons: The three largest sources of the 43,000 tons of hydrocarbons were motor vehicles, automobile evaporation losses and the storage and handling of gasoline. They contributed 43 percent, 28 percent, and 17 percent

respectively, of total hydrocarbon emissions. The remaining 12 percent was divided among industrial process sources, solid waste disposal, aircraft, and evaporative losses from dry cleaning plants.

Nitrogen Oxides: The two largest sources of nitrogen oxides were stationary fuel combustion and transportation sources accounting for 23 percent and 63 percent, respectively. The other 14 percent was emitted from solid waste disposal and process sources.

TABLE 1 SUMMARY OF AIR POLLUTANT EMISSIONS IN THE EL PASO STUDY AREA, 1969 (Tons/Year)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Transportation					
Motor Vehicles	1,400	2,650	216,800	18,370	15,020
Other	30	520	8,500	1,830	810
Subtotal	1,430	3,170	225,300	20,200	15,830
Stationary Fuel Combustion					
Industry	N	20	0	0	230
Steam-Electric	N	170	0	0	4,300
Residential	N	90	N	0	570
Commercial and Institutional	N	60	N	0	370
Subtotal	10	340	N	0	5,470
Refuse Disposal					
Incineration	130	630	2,780	50	190
Open Burning	60	900	4,780	1,690	620
Subtotal	190	1,530	7,560	1,740	810
Industrial Processes	357,700	26,900	111,550	740	1,900
Evaporative Losses	--	--	--	20,310	--
GRAND TOTAL*	359,300	31,900	344,400	43,000	24,000

* Totals have been rounded

N = Negligible

TABLE 1A SUMMARY OF AIR POLLUTANT EMISSIONS IN THE EL PASO STUDY AREA, 1969 (10^3 Kg/Year)

Source Category	Sulfur Oxides	Partic-ulates	Carbon Monoxide	Hydro-carbons	Nitrogen Oxides
Transportation					
Motor Vehicles	1,270	2,400	196,600	16,660	13,620
Other	30	470	7,700	1,660	730
Subtotal	1,300	2,870	204,300	18,320	14,350
Stationary Fuel Combustion					
Industry	N	20	0	0	210
Steam-Electric	N	150	0	0	3,900
Residential	N	80	N	0	520
Commercial and Institutional	N	50	N	0	340
Subtotal	10	300	N	0	4,970
Refuse Disposal					
Incineration	120	570	2,520	50	170
Open Burning	50	820	4,340	1,530	560
Subtotal	170	1,390	6,860	1,580	730
Industrial Processes	324,400	24,400	101,200	670	1,720
Evaporative Losses	--	--	--	18,420	--
TOTAL ALL SOURCES*	325,900	28,900	312,400	39,000	21,800

* = Totals have been rounded

N = Negligible

TABLE 2 PERCENTAGE CONTRIBUTION OF EACH SOURCE CATEGORY TO TOTAL EMISSIONS IN THE EL PASO STUDY AREA

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Transportation					
Motor Vehicles	.4	8.3	62.9	42.8	62.6
Other	N	1.6	2.5	4.2	3.3
Subtotal	.4	9.9	65.4	45.0	65.9
Stationary Fuel Combustion					
Industry	0	N	0	0	.9
Steam-Electric	N	.5	0	0	18.0
Residential	N	.3	N	0	2.4
Commercial and Institutional	N	.2	N	0	1.5
Subtotal	N	1.0	N	0	22.8
Solid Waste Disposal					
Incineration	N	2.0	.8	.1	.8
Open Burning	N	2.8	1.4	3.9	2.6
Subtotal	.1	4.8	2.2	4.0	3.4
Industrial Processes	99.5	84.3	32.4	1.7	7.9
Evaporative Losses					
Dry Cleaning	--	--	--	2.5	--
Automobiles	--	--	--	27.5	--
Gasoline Storage and Handling	--	--	--	17.3	--
Subtotal	--	--	--		--
TOTAL ALL SOURCES	100.0	100.0	100.0	100.0	100.0

DESCRIPTION OF STUDY AREA

The Study Area for the emission survey of El Paso consists of seven counties--Dona Ana, Grant, Luna, Otero, and Sierra Counties in New Mexico and El Paso and Hudspeth Counties in Texas. The seven county area is located in the far western part of Texas and the southern part of New Mexico. Figure 1 shows the location of the El Paso Study Area relative to the other large cities in its vicinity.

Figure 2 represents a more detailed drawing of the El Paso Study Area showing the boundaries of the urban areas of El Paso, Las Cruses, and Deming. The Study Area occupies 27,100 square miles and contains an estimated 1969 population of 554,800, which is approximately a 28 percent increase since 1960 (Table 3).

TOPOGRAPHY

The Franklin Mountains begin within the El Paso City limits and extend northward. Relatively flat arid land lies both east and west of the city. The Rio Grande River forms a natural boundary between El Paso and Juaraz, Mexico. The remainder of the Study Area is flat and arid with some mountainous regions.

CLIMATOLOGY

The meteorological conditions in the El Paso Study Area are influenced by the mountains. They add noticeably to the gustiness of the winds and cause changes in direction. Rainfall throughout the year is light and generally insufficient for any growth except desert vegetation unless irrigation is used. Daytime summer temperatures are high and the summers fairly long. Winter daytime temperatures are mild and drop below freezing about half the time. Dust and sandstorms are common during the spring.

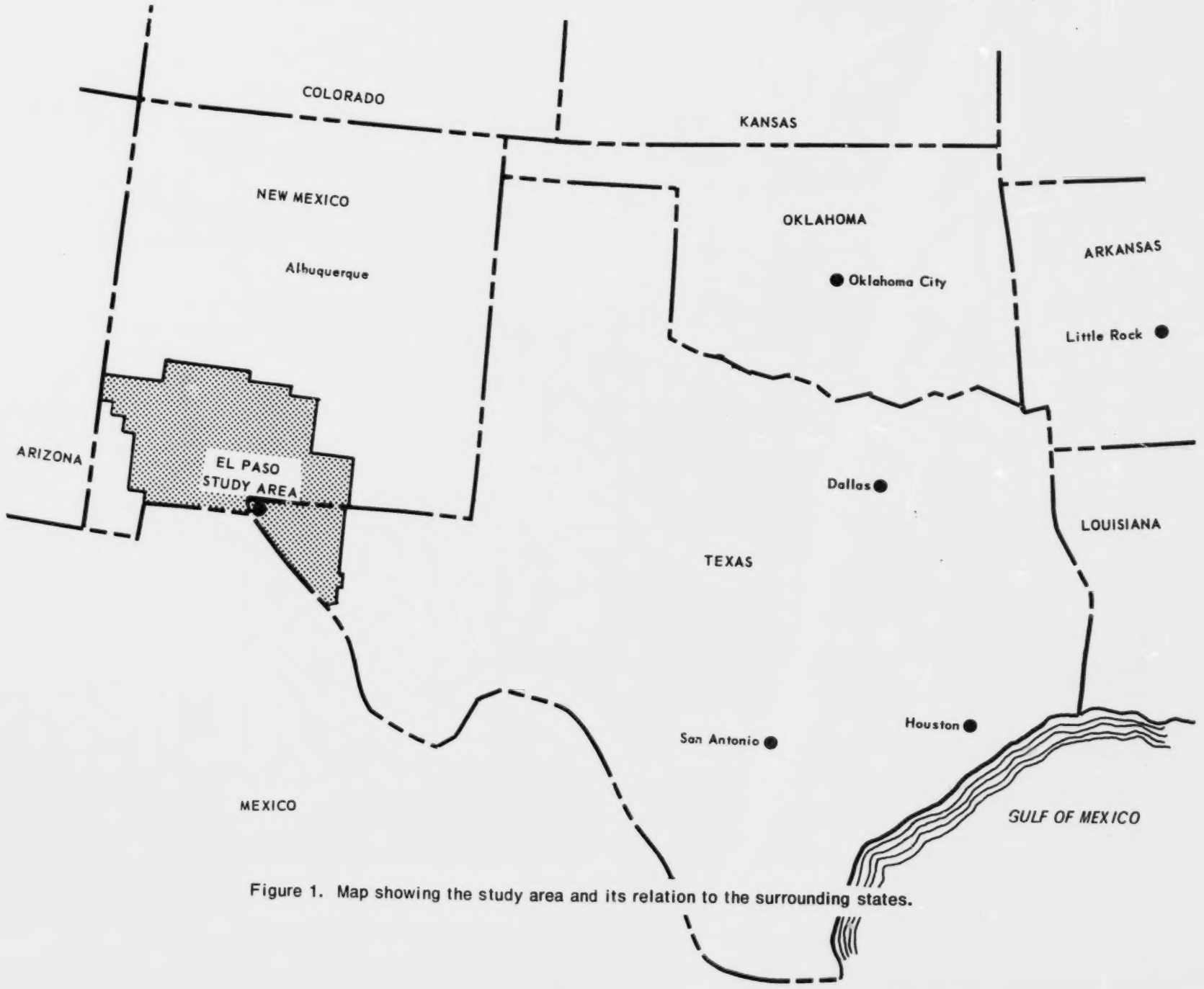

Figure 1. Map showing the study area and its relation to the surrounding states.

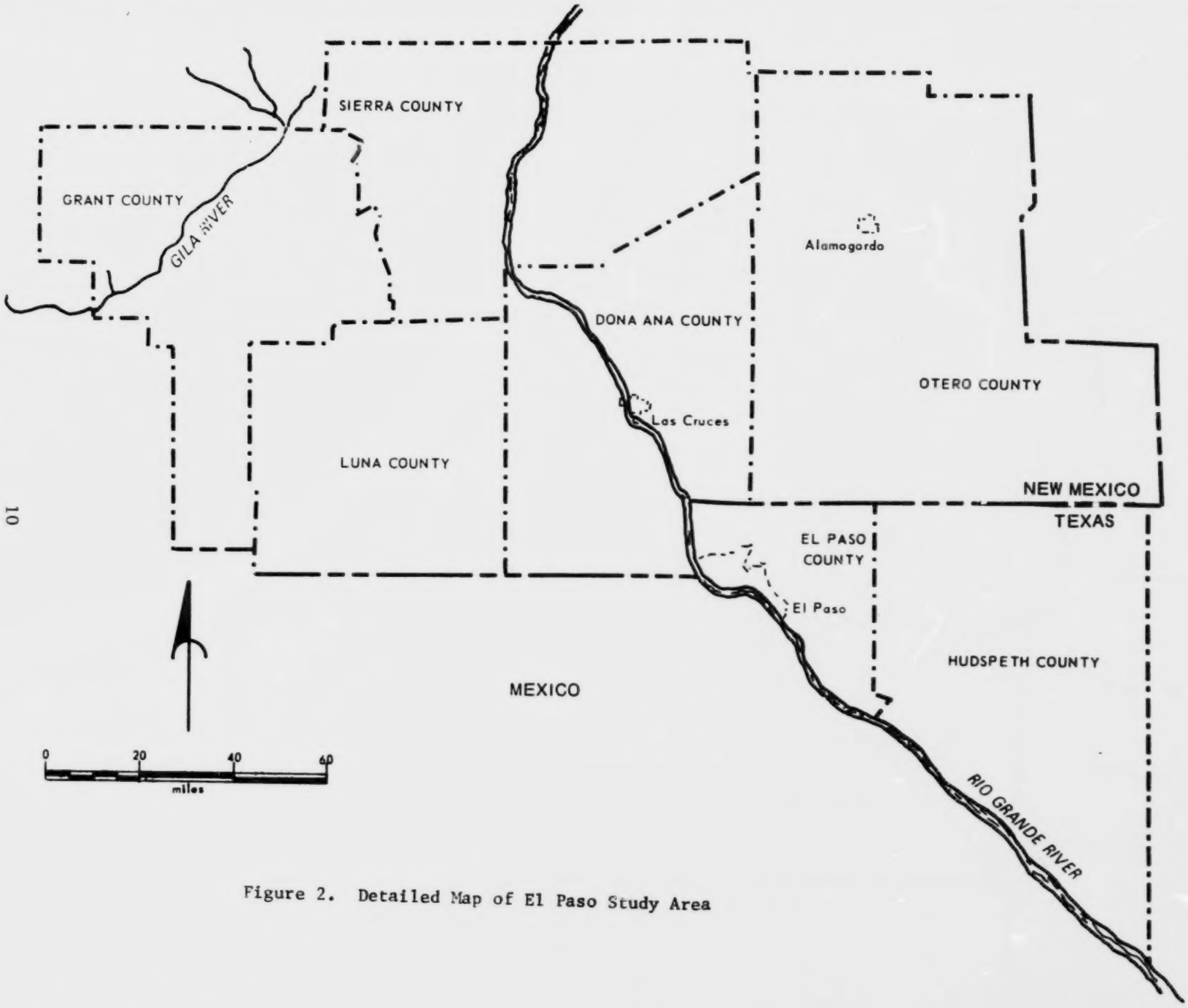

Figure 2. Detailed Map of El Paso Study Area

TABLE 3 AREA AND POPULATION CHARACTERISTICS FOR THE EL PASO STUDY AREA

County	(Sq. Mi.) Land Area	Population 1960	Population 1969	Population Density (1969)
Dona Ana	3,804	59,948	78,000	20
El Paso	1,054	300,993	367,000	348
Grant	3,970	18,700	25,000	6
Hudspeth	4,500	2,608	2,600	6
Luna	2,957	9,839	11,300	4
Otero	6,638	36,976	39,000	6
Sierra	4,179	6,409	8,500	2
TOTAL STUDY AREA	27,102	434,573	554,800	20

MAJOR INDUSTRIAL FACTORS

Table 4 shows selected manufacturing establishments in the Study Area by county for 1963.[3] Heavy industry is limited to several copper smelters and refineries, a fair sized foundry, a small steel mill, and an acid manufacturer.

TABLE 4 SELECTED MANUFACTURING ESTABLISHMENTS IN THE EL PASO STUDY AREA

Type of Establishment	Number of Establishments by County							Study Area
	Dona Ana	El Paso	Grant	Hudspeth	Luna	Otero	Sierra	
Food and Tobacco	2	22	--	--	1	1	--	26
Paper and Printing	1	4	1	--	--	1	--	7
Chemicals, Petroleum	--	3	--	--	1	--	--	4
Lumber, Wood	--	1	--	--	--	1	--	2
Stone, Clay, Glass	1	7	--	--	--	--	--	8
Metal Products	--	9	2	--	--	--	--	11
TOTAL	4	46	3	0	2	3	0	58

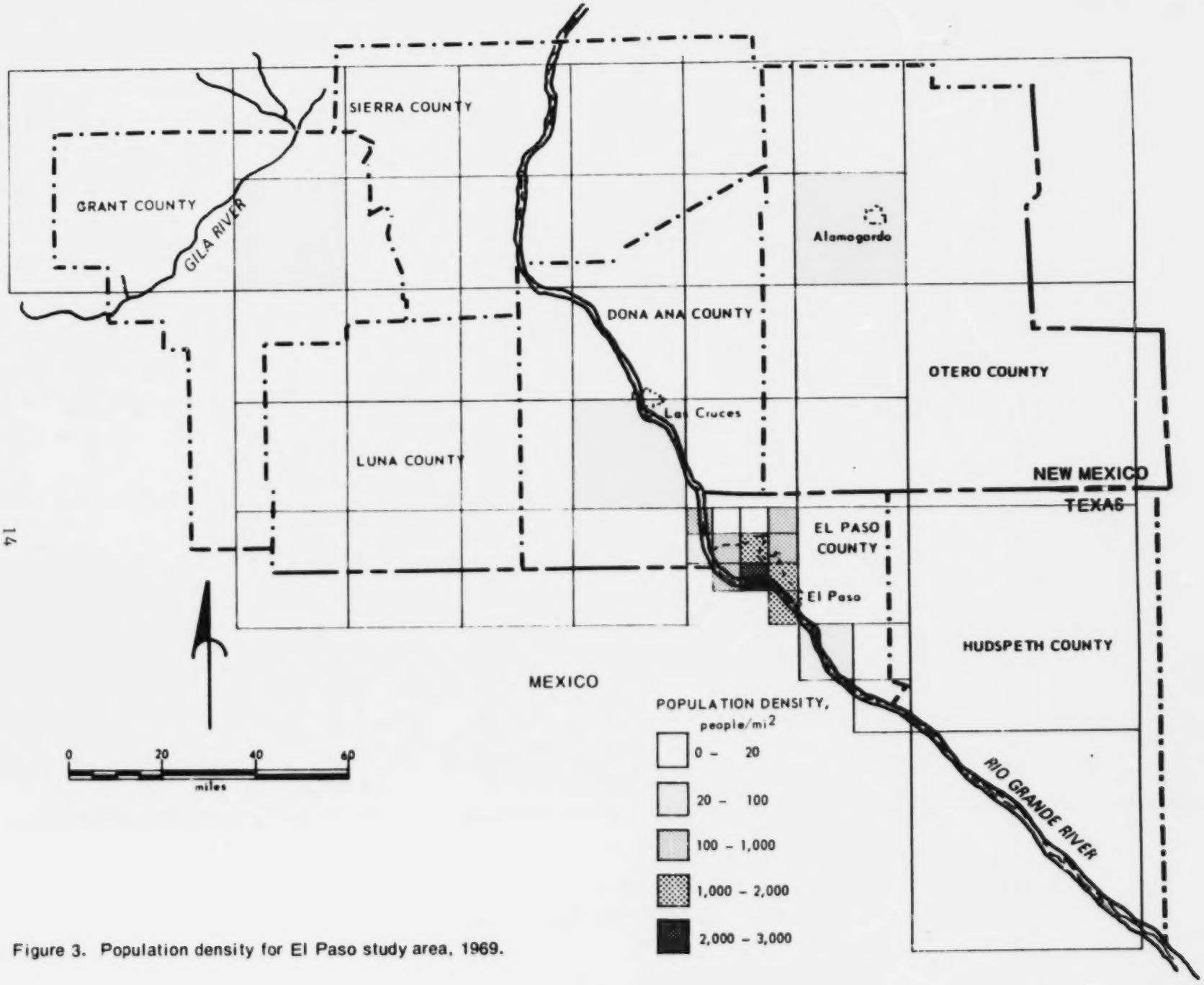

Figure 3. Population density for El Paso study area, 1969.

GRID COORDINATE SYSTEM

A grid coordinate system, based on the Universal Transverse Mercator Projection (UTM) was used in the El Paso Study Area to show the geographical distribution of emissions. A map of this grid system is presented in Figure 4.

The UTM system was chosen due to its advantages over other standard grid systems such as the Latitude-Longitude and State Plane Coordinate Systems. The major advantages of this system are that (1) it is continuous across the country and is not hindered by political subdivisions, (2) the grids are of uniform size throughout the country, (3) it has world-wide use, and (4) the grids are square in shape--a necessary feature for use in meteorological dispersion models.

The Universal Transverse Mercator Projection is based upon the metric system. Each north-south and east-west grid line, as illustrated in Figure 4, is identified by a coordinate number expressed in meters. Each point source and grid are identified by the horizontal and vertical coordinates of their geographical center to the nearest 100 meters.

Grid zones of different sizes are used to limit the number of grid zones and yet allow a satisfactory definition of the geographical gradation of emissions. The majority of the emissions is usually concentrated in the populated and industrialized portions of a Study Area. Smaller grids are placed over these areas in order to reflect abrupt changes in emissions within short distances. Since only a small percentage of the total emissions occur in rural areas, larger grid zones are normally used to show the distribution of emissions in these lightly populated portions of a Study Area.

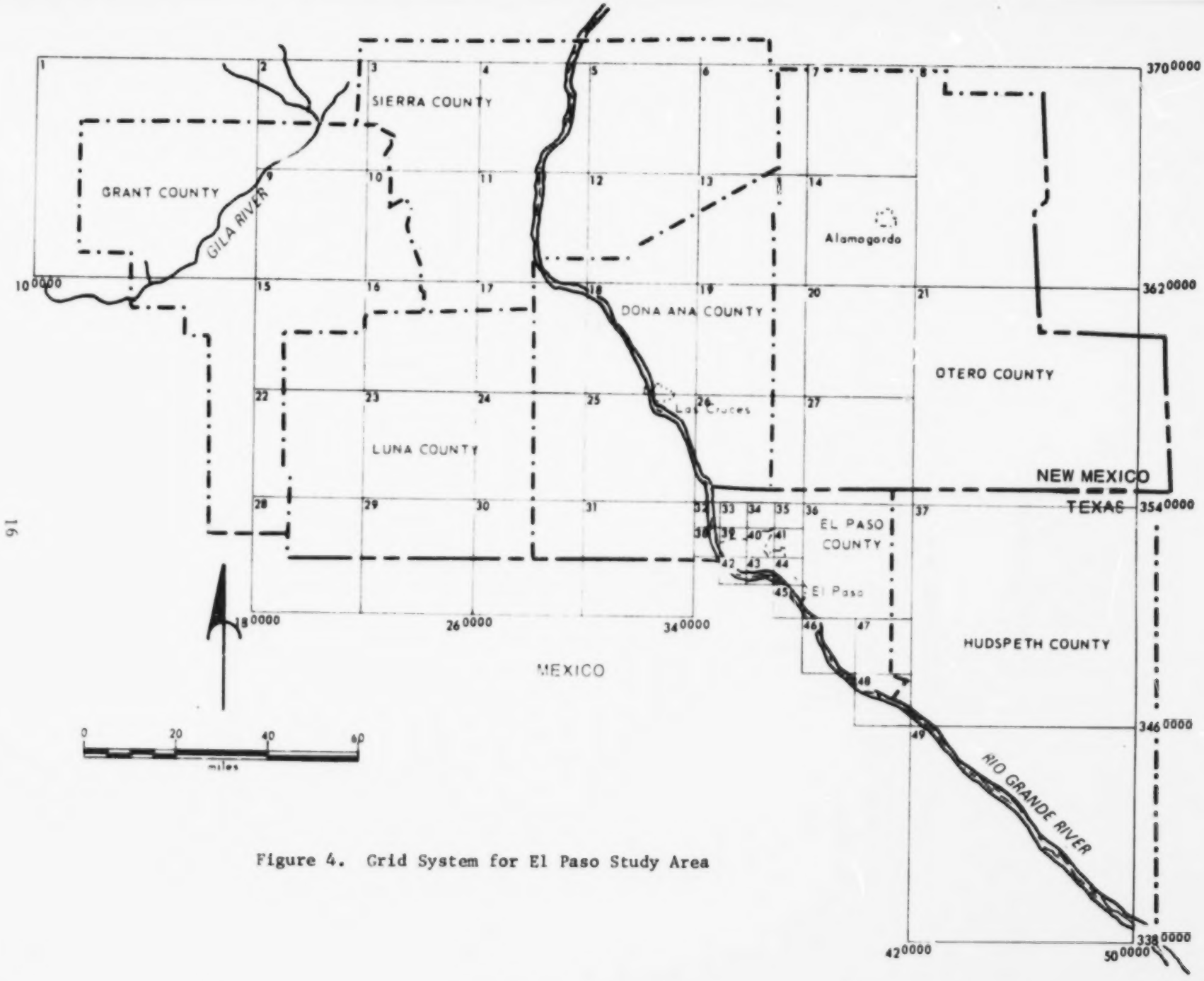

Figure 4. Grid System for El Paso Study Area

EMISSIONS BY CATEGORY

For the purposes of compiling the basic data and emission estimates, the air pollutant sources were classified into the following five categories:

1. Stationary Fuel Combustion
2. Transportation
3. Solid Waste Disposal
4. Industrial Processes
5. Evaporative Losses

Each of these categories is considered individually in this section where data sources are given and methods of calculation discussed.

STATIONARY FUEL COMBUSTION

The stationary fuel combustion category is concerned with any fixed source which burns fuels for either space heating or process heating. The four primary sources in this category are industrial facilities, steam-electric plants, residential housing, and commercial and institutional establishments. Table 5 presents a summary of the fuels consumed in the Study Area, and Table 6 provides an average chemical analysis of these fuels.

Steam-Electric Utility

METHODOLOGY: Data on the two power plants in the area were obtained from the 1969 edition of the steam-electric plant factor book published by the National Coal Association. Both plants used gas as their main fuel in 1969. A very small smount of fuel oil was used at one of them in a standby capacity.

RESULTS: These two power plants contributed approximately 18 percent of the total nitrogen oxides emitted in the area. Emissions from other pollutants were negligible. Air pollutant emissions from these plants as well as from all other fuel combustion sources are summarized in Table 7.

TABLE 5 ANNUAL FUEL CONSUMPTION IN POLITICAL SUBDIVISIONS OF THE EL PASO STUDY AREA

Fuel - Jurisdiction	Industry	Steam-Electric	Residential	Commercial-Institutional	Total
Natural Gas (Mill. cu.ft/yr.)					
Dona Ana	111	6,034	1,046	333	7,524
El Paso	1,325	16,033	5,782	4,979	28,119
Grant	102	--	720	392	1,214
Hudspeth	125	--	212	11	348
Luna	312	--	183	312	807
Otero	105	--	580	315	1,000
Sierra	23	--	222	71	316
Total	2,103	22,067	8,745	6,413	39,328
Coal (Tons/Yr.)					
Dona Ana	--	--	--	--	--
El Paso	--	--	--	--	--
Grant	--	--	--	--	--
Hudspeth	--	--	--	--	--
Luna	--	--	--	--	--
Otero	--	--	--	--	--
Sierra	--	--	--	--	--
Total	N	--	N	N	N
Fuel Oil (1000 Gal./Yr.)					
Dona Ana	N	12.6	N	N	N
El Paso	N	--	N	N	N
Grant	N	--	N	N	N
Hudspeth	N	--	N	N	N
Luna	N	--	N	N	N
Otero	N	--	N	N	N
Sierra	N	--	N	N	N
Total	N	12.6	N	N	N

TABLE 6 SULFUR AND ASH CONTENT OF FUELS, 1969

Fuels	Percent Sulfur	Percent Ash
Residual Oil	1.5	--
Distillate Oil	0.3	--
Natural Gas	0.0008	--

TABLE 7 AIR POLLUTANT EMISSIONS FROM COMBUSTION OF FUELS IN STATIONARY SOURCES IN THE EL PASO STUDY AREA, 1969

(Tons/Year)

Fuel	User Category	Sulfur Oxides	Partic-ulates	Carbon Monoxide	Hydro-carbons	Nitrogen Oxides
Coal	Industrial	0	0	0	0	0
	Steam-Electric	0	0	0	0	0
	Residential	0	0	0	0	0
	Commercial and Institutional	0	0	0	0	0
Fuel Oil	Industrial	0	0	0	0	0
	Steam-Electric	0	0	0	0	0
	Residential	0	0	0	0	0
	Commercial and Institutional	0	0	0	0	0
Gas	Industrial	0	20	0	0	230
	Steam-Electric	N	70	0	0	4,300
	Residential	N	90	N	0	570
	Commercial and Institutional	N	60	N	0	370
GRAND TOTAL*		10	340	N		5,470

* = Totals have been rounded

N = Negligible

Industrial, Residential, Commercial and Institutional

METHODOLOGY: Natural gas, for all practical purposes, was the only fuel used in the study area. Data on the amount of natural gas used for these three categories were obtained from the local gas companies.

RESULTS: The emissions from stationary fuel combustion for these three categories were insignificant except for nitrogen oxides, for which 5 percent of the total was emitted.

TRANSPORTATION

Three types of transportation sources of air pollution are considered in this survey--motor vehicles, aircraft, and railroads. Motor vehicles, which are by far the most significant source in this category, are further subdivided according to type of fuel--gasoline or diesel.

Motor Vehicles

More than 8.1 million miles per day were traveled by motor vehicles in 1969 in the El Paso Study Area. Table 8 shows the miles of travel for gasoline and diesel vehicles for each county in the Study Area.

Vehicle-mile data for a large portion of the roads in El Paso County were supplied by the Texas Highway Department.[4] The vehicle miles were transferred onto the previously mentioned grid system. In the other counties vehicle-mile information was not available, and thus gasoline consumption was used to find vehicular emissions.

The contribution to the total motor vehicle pollution by diesel-powered vehicles was determined by average nation-wide data. Diesel-powered vehicles accounted for approximately 5 percent of the total vehicle miles in the country and about 1 percent in the city.

Emissions from road vehicles are a function of the speed at which the vehicle travels. Average speeds of 10-20 mph were assumed for down-town areas, 20-30 mph for the residential areas, and 30-45 mph for the rural areas to calculate vehicle emissions.

TABLE 8 VEHICLE MILES OF TRAVEL FOR ROAD VEHICLES IN EL PASO STUDY AREA PER DAY, 1969

Jurisdiction	(Thousand Miles) Gasoline Vehicle Miles	(Thousand Miles) Diesel Vehicle Miles	Total
Dona Ana	1,207	57	1,264
El Paso	4,820	134	4,954
Grant	487	23	510
Hudspeth	37	1	38
Luna	447	21	468
Otero	692	33	725
Sierra	168	8	176
Total	7,858	277	8,135

From all transportation sources, road vehicles accounted for 98 percent of the sulfur oxides, 83 percent of the particulates, 96 percent of the carbon monoxide, 91 percent of the hydrocarbons, and 95 percent of the nitrogen oxides. Gasoline powered motor vehicles contributed a greater percent of all pollutants than diesel powered motor vehicles. Emissions from transportation sources are summarized in Table 9.

Aircraft

Table 10 shows the air traffic activity at the airports in the Study Area. An estimate of the number of flights by engine type was supplied by the traffic controllers at the airports and summarized in Table 11.

The air pollutant emissions from aircraft include all phases of operation (taxi, take-off, climb out, approach and landing) that take place below the arbitrarily chosen altitude of 3,500 feet. Emissions at cruise altitude (above 3,500 feet) are not of concern in an emission inventory. From all transportation sources, aircraft accounted for 13 percent of the particulates, 4 percent of the carbon monoxide, 8 percent of the hydrocarbons and 4 percent of the nitrogen oxides.

Railroads

Railroad operations (mainly locomotive) consume more than 1.5 million gallons of diesel fuel per year within the Study Area. This quantity is about 10 percent as much as the amount of diesel fuel consumed by motor vehicles. The majority of this fuel is consumed during switching operations. Diesel fuel consumption data were supplied by each of the major railroads in the El Paso area. Railroad operations contribute less than 4 percent of any pollutant from all transportation sources.

SOLID WASTE DISPOSAL

Approximately 485,000 tons of refuse was generated during 1969 within the Study Area. Table 12 presents a solid waste balance for the El Paso Study Area, showing the various methods of disposal and the quantities disposed of by each method. About half of the refuse was disposed of in

TABLE 9 AIR POLLUTANT EMISSIONS FROM TRANSPORTATION SOURCES IN THE EL PASO STUDY AREA, 1969

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Motor Vehicles					
Gasoline	840	1,120	215,970	16,490	11,940
Diesel	560	1,530	830	1,880	3,080
Evaporation	--	--	--	--	--
Subtotal	1,400	2,650	216,800	18,370	15,020
Aircraft					
Jet	0	390	320	170	250
Piston	0	40	8,120	1,550	380
Turboprop	0	N	10	N	N
Subtotal	0	430	8,450	1,720	630
Railroads	30	90	50	100	170
Vessels	0	0	0	0	0
GRAND TOTAL*	1,430	3,170	225,300	20,200	15,830

* = Totals have been rounded

N = Negligible

TABLE 10 AIR TRAFFIC ACTIVITY AT AIRPORTS LOCATED IN THE EL PASO STUDY AREA, 1969

Source Category	El Paso International		Biggs AFB		Holloman AFB	
	Itinerant Operation**	Local Operation	Itinerant Operation	Local Operation	Itinerant Operation	Local Operation
Air Carrier	36,196	--	--	--	--	--
General Aviation	100,045	78,600	--	--	--	--
Military	19,789	6,800	52,188	*	62,200	*
Totals	156,030	85,400	52,188		62,200	

* = Included under ininerant operations

** = Operation take-off or landing

TABLE 11 AIR TRAFFIC ACTIVITY BY ENGINE TYPE FOR THE EL PASO STUDY AREA, 1969

Engine Type	Number of Flights*
1 Engine Jet	18,000
2 Engine Jet	23,100
3 Engine Jet	9,000
4 Engine Jet	5,400
2 Engine Turboprop	900
4 Engine Turboprop	1,800
1 Engine Piston	85,500
2 Engine Piston	33,200
4 Engine Piston	1,300
Total	178,200

* = Flight combination take-off and landing

TABLE 12 SOLID WASTE DISPOSAL IN EL PASO STUDY AREA, 1969 (Tons/Year)

County	Total Refuse Generated	Incineration		Open Burning			
		On-Site	Municipal	Dumps	On-Site	Dumps	Wood Waste Burning
Dona Ana	71,000	12,000	--	34,500	8,500	16,000	--
El Paso	335,000	97,000	--	175,500	25,500	37,000	--
Grant	22,800	4,600	--	10,400	3,100	4,700	--
Hudspeth	2,400	200	--	200	200	1,800	--
Luna	10,300	2,400	--	1,700	1,700	4,500	--
Otero	35,600	8,700	--	18,900	6,000	2,000	--
Sierra	7,800	1,700	--	4,800	1,300	--	--
TOTALS	484,900	126,600	--	246,000	46,300	6,600	--

on-site incineration and open burning in both on-site and dumps. Refuse data for all of the counties were supplied by the local air pollution agency.

Incineration

There is only one major category of incineration in the El Paso Study Area--on-site. On-site incineration disposed of 26 percent of the generated refuse. This included 4 large teepee type incinerators. The contribution of on-site incinerators to the total solid waste emissions are shown in Table 13. El Paso does not have any municipal incinerators.

Open Burning

The two major types of open burning are open burning dumps and on-site open burning. The contributions of each of these to total solid waste emissions are shown in Table 13. The largest open burning point sources in the Study Area are 2 open burning dumps in El Paso County.

INDUSTRIAL PROCESS LOSSES

The Study Area has relatively few heavy industrial complexes. From an air pollution standpoint, 2 copper smelters, 1 steel mill, 2 refineries, 1 large foundry, an acid plant, a quarry, and several cement and asphalt batching plants were the most significant process sources. Table 14 presents a summary of the emissions.

The 2 copper smelters were major sources of sulfur oxides and particulates contributing 98 and 2 percent of the total process losses respectively. Both smelters have controls installed for particulates, but neither recover the sulfur oxides generated from the smelting of the sulfur rich ore. One of the smelters is located in El Paso County inside the El Paso city limits and the other is located in Hurley, New Mexico.

The steel mill located in the northwest corner of El Paso County is of moderate size and accounts for about 2 percent of the total process

TABLE 13 AIR POLLUTANT EMISSIONS FROM SOLID-WASTE DISPOSAL IN THE EL PASO STUDY AREA, 1969 (Tons/Year)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Incineration					
Municipal	0	0	0	0	0
On-Site	130	630	2,780	50	190
Subtotal	130	630	2,780	50	190
Open Burning					
On-Site	20	370	1,970	700	260
Dump	40	530	2,810	990	360
Subtotal	60	900	4,780	1,690	620
GRAND TOTAL*	190	1,530	7,560	1,740	810

* = Totals have been rounded

TABLE 14 AIR POLLUTANT EMISSIONS FROM PROCESS LOSS SOURCES IN THE EL PASO STUDY AREA, 1969 (Tons/Year)

Type of Industry	Sulfur Oxides	Partic-ulates	Carbon Monoxide	Hydro-carbons	Nitrogen Oxides
Asphalt Batching	0	910	0	0	0
Cement	0	650	0	0	0
Chemicals	830	40	0	0	0
Feed Lots	0	370	0	0	0
Foundry	10	12,040	0	0	0
Quarrying	0	9,530	0	0	0
Refining	7,940	930	101,210	--	1,820
Smelter	348,940	430	0	0	0
Steel	0	530	0	0	0
TOTAL*	357,700	25,400	101,200	0	1,800

* = Totals have been rounded off

losses of particulates. A baghouse has been recently installed and emissions should be reduced considerably.

Both refineries are located on the southeast side of El Paso and constitute the only process sources of the 101,200 annual tons of carbon monoxide. They also emit 2 percent of the sulfur oxides, 4 percent of the particulates, and 99 percent of the nitrogen oxides from process sources.

The two major process sources of particulates are a limestone quarry located on the north side of El Paso and a foundry located in the same area as the refineries. They contributed 37 percent and 47 percent respectively.

The remaining process sources account for a negligible percentage of the sulfur oxides and 8 percent of the particulate emissions.

EVAPORATIVE LOSSES

Three source categories were considered for evaporative losses--automobiles, gasoline storage and handling, and the manufacture and consumption of solvents. The hydrocarbon emissions from all sources by evaporative losses are shown in Table 15.

Automobiles

Automobile evaporation losses include gas tank and carburetor evaporation and engine crankcase blowby. Since 1963, most new automobiles were equipped with positive crankcase ventilation (PCV) valves that reduce hydro-carbon emissions from the crankcase by about 90 percent. Due to a lag time in the automobile replacement rate, it was assumed that 20 percent of the automobiles were not equipped with PCV valves.

The hydrocarbon emissions from automobiles were calculated from vehicle-mile data and were apportioned onto grids using the same methods as for motor vehicles discussed earlier. Evaporative losses from automobiles accounted for 58 percent of the total hydrocarbon emissions from evaporative losses in the Study Area.

TABLE 15 HYDROCARBON EMISSIONS FROM EVAPORATIVE LOSSES SOURCES IN THE EL PASO STUDY AREA, 1969 (Tons/Year)

Type of Source	HC Emissions (Tons/Year)
Gasoline Storage and Handling	7,460
Dry Cleaning	1,060
Other	0
Auto	11,800
TOTAL	20,320

Gasoline Storage and Handling

There are four major points (excluding evaporation from the motor vehicle) of hydrocarbon emissions in the storage and handling of gasoline. They are:

1. Breathing and filling losses from storage tanks
2. Filling losses from loading tank conveyances
3. Filling losses from loading underground storage tanks at service stations.
4. Spillage and filling losses in filling automobile gas tanks at service stations.

The evaporative losses from storage and the subsequent handling of the gasoline accounted for 37 percent of the total evaporative losses.

Manufacture and Consumption of Solvents

Since no solvent manufacturing companies were found in El Paso this category included only the consumption of solvents at dry cleaning plants. Organic solvents emitted from dry cleaning plants were determined by assuming an emission rate of 4 lb/capita/year.[5] The resulting emissions were apportioned onto grids by population. Dry cleaning plants accounted for only 5 percent of the hydrocarbon emissions from evaporative losses in the El Paso area. No estimates were made on the evaporation of solvents from surface coating operations and for industrial and domestic uses.

EMISSIONS BY JURISDICTION

The previous section presented the air pollutant emissions by source category. In order to show the contribution of each county to the pollution in the entire Study Area, their emissions are summarized in Tables 16 through 22.

TABLE 16 SUMMARY OF AIR POLLUTANT EMISSIONS IN GRANT COUNTY, 1969
(Tons/Year)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Transportation					
Motor Vehicles	80	150	10,730	940	850
Other	0	0	0	0	0
Subtotal	80	150	10,730	940	850
Stationary Fuel Combustion					
Industry	0	0	0	0	10
Steam-Electric	0	0	0	0	0
Residential	0	10	0	0	50
Commercial and Institutional	0	N	0	0	20
Subtotal	0	10	0	0	80
Refuse Disposal					
Incineration	N	20	100	N	10
Open Burning	N	60	330	120	40
Subtotal	10	80	430	120	50
Industrial Processes	220,100	140	0	0	0
Evaporative Losses	--	--	--	890	--
TOTAL ALL SOURCES*	220,200	400	11,200	2,000	1,000

* = Totals have been rounded

N = Negligible

TABLE 17 SUMMARY OF AIR POLLUTANT EMISSIONS IN SIERRA COUNTY, 1969
(Tons/Year)

Source Category	Sulfur Oxides	Partic-ulates	Carbon Monoxide	Hydro-carbons	Nitrogen Oxides
Transportation					
Motor Vehicles	30	55	3,420	320	320
Other	0	0	0	0	0
Subtotal	30	55	3,420	320	320
Stationary Fuel Combustion					
Industry	0	0	0	0	N
Steam-Electric	0	0	0	0	0
Residential	0	N	0	0	10
Commercial and Institutional	0	0	0	0	N
Subtotal	0	N	0	0	20
Refuse Disposal					
Incineration	N	10	40	0	N
Open Burning	0	10	50	20	10
Subtotal	N	20	90	20	10
Industrial Processes	0	0	0	0	0
Evaporative Losses	--	--	--	330	--
TOTAL ALL SOURCES*	30	80	3,500	700	300

* = Totals have been rounded

N = Negligible

TABLE 18 SUMMARY OF AIR POLLUTATN EMISSIONS IN OTERO COUNTY, 1969

(Tons/Year)

Source Category	Sulfur Oxides	Partic-ulates	Carbon Monoxide	Hydro-carbons	Nitrogen Oxides
Transportation					
Motor Vehicles	120	230	14,650	1,350	1,330
Other	0	210	790	160	160
Subtotal	120	440	15,440	1,510	1,490
Stationary Fuel Combustion					
Industry	0	0	0	0	10
Steam-Electric	0	0	0	0	0
Residential	0	10	0	0	30
Commercial and Institutional	0	N	0	0	20
Subtotal	0	10	0	0	70
Refuse Disposal					
Incineration	10	40	190	N	10
Open Burning	N	60	340	120	40
Subtotal	10	100	530	120	50
Industrial Processes	0	1,480	10,340	740	80
Evaporative Losses	--	--	--	1,370	--
TOTAL ALL SOURCES*	130	2,030	26,310	3,740	1,690

* = Totals have been rounded

N = Negligible

TABLE 19 SUMMARY OF AIR POLLUTANT EMISSIONS IN LUNA COUNTY, 1969

(Tons/Year)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Transportation					
Motor Vehicles	80	150	9,590	880	860
Other	0	0	0	0	0
Subtotal	80	150	9,590	880	860
Stationary Fuel Combustion					
Industry	0	N	0	0	30
Steam-Electric	0	0	0	0	0
Residential	0	10	0	0	50
Commercial and Institutional	0	N	0	0	20
Subtotal	0	10	0	0	100
Refuse Disposal					
Incineration	N	10	50	0	N
Open Burning	N	50	270	90	30
Subtotal	N	60	320	90	30
Industrial Processes	0	0	0	0	0
Evaporative Losses	--	--	--	860	--
TOTAL ALL SOURCES*	80	220	9,910	1,830	1,000

* = Totals have been rounded

N = Negligible

TABLE 20 SUMMARY OF AIR POLLUTANT EMISSIONS IN DONA ANA COUNTY, 1969

(Tons/Year)

Source Category	Sulfur Oxides	Partic-ulates	Carbon Monoxide	Hydro-carbons	Nitrogen Oxides
Transportation					
Motor Vehicles	210	400	30,940	2,680	2,320
Other	0	0	0	0	0
Subtotal	210	400	30,940	2,680	2,320
Stationary Fuel Combustion					
Industry	0	0	0	0	10
Steam-Electric	N	50	0	0	1,180
Residential	0	10	0	0	60
Commercial and Institutional	0	N	0	0	20
Subtotal	N	60	0	0	1,270
Refuse Disposal					
Incineration	10	60	260	N	20
Open Burning	10	190	1,040	370	130
Subtotal	20	250	1,300	370	150
Industrial Processes	0	1,280	0	0	0
Evaporative Losses	--	--	--	2,410	--
TOTAL ALL SOURCES*	240	1,990	32,240	5,460	3,740

* = Totals have been rounded

N = Negligible

TABLE 21 SUMMARY OF AIR POLLUTANT EMISSIONS IN EL PASO COUNTY, 1969
(Tons/Year)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Transportation					
Motor Vehicles	870	1,660	146,800	12,140	9,270
Other	30	300	7,710	1,670	650
Subtotal	900	1,960	154,510	13,810	9,920
Stationary Fuel Combustion					
Industry	0	10	0	0	140
Steam-Electric	N	120	0	0	3,130
Residential	N	60	N	0	350
Commercial and Institutional	0	50	0	0	290
Subtotal	10	240	N	0	3,910
Refuse Disposal					
Incineration	100	480	2,130	40	150
Open Burning	30	500	2,660	940	340
Subtotal	130	980	4,790	980	490
Industrial Processes	137,630	24,010	101,210	0	1,830
Evaporative Losses	--	--	--	14,390	--
TOTAL ALL SOURCES*	138,700	27,190	260,500	29,180	16,150

* = Totals have been rounded

N = Negligible

TABLE 22 SUMMARY OF AIR POLLUTANT EMISSIONS IN HUDSPETH COUNTY, 1969
(Tons/Year)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Transportation					
Motor Vehicles	10	10	680	60	60
Other	0	0	0	0	0
Subtotal	10	10	680	60	60
Stationary Fuel Combustion					
Industry	0	N	0	0	20
Steam-Electric	0	0	0	0	0
Residential	0	N	0	0	10
Commercial and Institutional	0	0	0	0	0
Subtotal	0	N	0	0	30
Refuse Disposal					
Incineration	0	0	N	0	0
Open Burning	0	20	90	30	10
Subtotal	0	20	90	30	10
Industrial Processes	0	0	0	0	0
Evaporative Losses	--	--	--	70	--
TOTAL ALL SOURCES*	10	30	770	160	100

* = Totals have been rounded

N = Negligible

EMISSIONS BY GRID

For the purpose of defining the geographical variation of air pollutant emissions in the Study Area, the resulting emissions were apportioned on the grid coordinate system. The emissions were divided into two source groups--point and area sources. Thirty-two point sources are identified individually with respect to location and emissions. Each of these point sources emitted more than 0.1 tons per average annual day of any pollutant.

CONTRIBUTIONS OF POINT AND AREA SOURCES

Figure 5 shows the location of all point sources in the area. Collectively the 32 point sources account for 99.5 percent of all sulfur oxides emissions, 87 percent of particulate matter, 29 percent of nitrogen oxides, 19 percent of hydrocarbons, and 35 percent of carbon monoxide. Table 23 presents the emissions of point sources. Each source is identified by source category, grid number and horizontal and vertical coordinates. The emissions of sulfur oxides, particulates, carbon monoxide, hydrocarbons, and nitrogen oxides are shown for an average annual day, average winter day (December, January, February), and average summer day (June, July, August). The appendix presents the method of calculating these three averages.

Area sources are sources of emissions that are insignificant by themselves, but as a group may emit a large portion of the area's total pollution. Examples of area sources are motor vehicles, residences, light commercial and industrial establishments and backyard burning. The emissions from area sources have been added to that for point sources to obtain total emissions from all sources by grid, as shown in Table 24. The emissions from all sources are also shown for an annual average, winter and summer day.

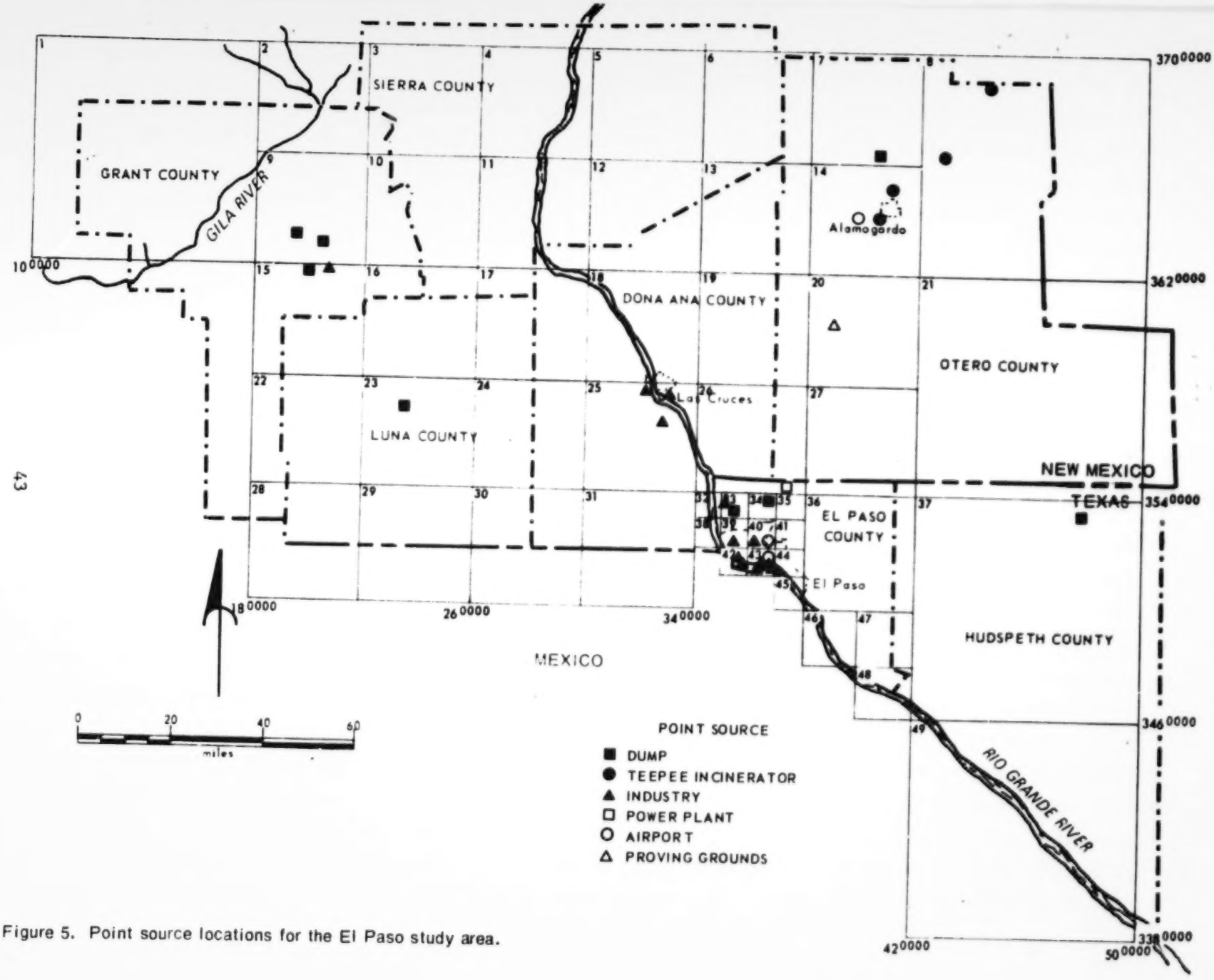

Figure 5. Point source locations for the El Paso study area.

TABLE 23 SUMMARY OF AIR POLLUTANT EMISSIONS FROM POINT SOURCES IN THE EL PASO STUDY AREA, 1969
TONS/DAY

				SOX			PART			CO			HC			NOX		
ID	GR	HC	VC	S	W	A	S	W	A	S	W	A	S	W	A	S	W	A
5	7	4050	36625	0.0	0.0	0.0	0.04	0.04	0.04	0.22	0.22	0.22	0.08	0.08	0.08	0.02	0.02	0.02
6	8	4320	367 0	0.0	0.0	0.0	0.20	0.20	0.20	1.24	1.24	1.24	0.10	0.10	0.10	0.00	0.00	0.00
6	8	4410	36850	0.0	0.0	0.0	0.35	0.35	0.35	2.17	2.17	2.17	0.17	0.17	0.17	0.00	0.00	0.00
5	9	2025	36275	0.0	0.0	0.0	0.02	0.02	0.02	0.12	0.12	0.12	0.04	0.04	0.04	0.01	0.01	0.01
5	9	2050	36250	0.0	0.0	0.0	0.03	0.03	0.03	0.19	0.19	0.19	0.06	0.06	0.06	0.02	0.02	0.02
6	14	4090	364 0	0.0	0.0	0.0	0.99	0.99	0.99	6.49	6.49	6.49	0.50	0.50	0.50	0.06	0.06	0.06
6	14	4125	36490	0.0	0.0	0.0	2.49	2.49	2.49	16.29	16.29	16.29	1.24	1.24	1.24	0.15	0.15	0.15
7	14	3980	36340	0.0	0.0	0.0	0.58	0.58	0.58	2.15	2.15	2.15	0.44	0.44	0.44	0.42	0.42	0.42
2	15	2060	36190	602.9	602.9	602.9	0.38	0.38	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	15	2030	36175	0.0	0.0	0.0	0.02	0.02	0.02	0.11	0.11	0.11	0.04	0.04	0.04	0.01	0.01	0.01
2	20	3825	358 0	0.0	0.0	0.0	0.00	0.00	0.00	2.09	2.09	2.09	0.00	0.00	0.00	0.00	0.00	0.00
5	23	2425	35775	0.0	0.0	0.0	0.09	0.09	0.09	0.52	0.52	0.52	0.18	0.18	0.18	0.06	0.06	0.06
2	25	3320	35740	0.0	0.0	0.0	2.49	2.49	2.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	25	3300	35770	0.0	0.0	0.0	0.70	0.70	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	25	3310	35640	0.0	0.0	0.0	0.30	0.30	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	25	3740	35410	0.0	0.0	0.0	0.33	0.33	0.32	0.00	0.00	0.00	0.00	0.00	0.00	8.68	8.68	8.56
2	33	3510	35370	0.0	0.0	0.0	1.44	1.44	1.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	33	3525	35350	0.0	0.0	0.0	0.32	0.32	0.32	1.74	1.74	1.74	0.61	0.61	0.61	0.22	0.22	0.22
5	34	3675	35375	0.0	0.0	0.0	0.43	0.43	0.43	2.32	2.32	2.32	0.82	0.82	0.82	0.30	0.30	0.30
5	37	4875	35340	0.0	0.0	0.0	0.02	0.02	0.02	0.15	0.15	0.15	0.05	0.05	0.05	0.01	0.01	0.01
2	39	3535	352 0	0.0	0.0	0.0	0.12	0.12	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	40	3610	35210	0.0	0.0	0.0	25.99	25.99	25.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	40	3695	35235	0.0	0.0	0.0	0.04	0.04	0.04	3.38	3.38	3.38	0.65	0.65	0.65	0.17	0.17	0.17
2	42	3555	35180	0.0	0.0	0.0	1.76	1.76	1.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	42	3560	35170	352.9	352.9	352.9	0.79	0.79	0.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE 23 (Cont.)

4	42	3540	35195	0.0	0.0	0.0	0.12	0.12	0.12	0.00	0.00	0.00	0.00	0.00	0.00	3.27	3.27	3.22
2	43	3675	35155	13.7	13.7	13.7	0.35	0.35	0.35	55.29	55.29	55.29	4.34	1.40	2.93	1.41	1.41	1.41
2	43	3680	35160	7.9	7.9	7.9	2.18	2.18	2.18	221.99	221.99	221.99	12.79	4.30	8.50	3.55	3.55	3.55
2	43	3685	35165	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	2.75	0.85	1.90	0.00	0.00	0.00
2	43	3685	35150	2.2	2.2	2.2	0.11	0.11	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	43	3680	35150	0.0	0.0	0.0	32.99	32.99	32.99	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.03
7	43	3675	35180	0.0	0.0	0.0	0.55	0.55	0.55	17.60	17.60	17.60	3.61	3.61	3.61	1.13	1.13	1.13

ID KEY

2 = Industrial
4 = Steam-Electric
5 = Dump
6 = Incinerator
7 = Airport

TABLE 24 SUMMARY OF AIP POLLUTANT EMISSIONS FROM ALL SOURCES IN THE EL PASO STUDY AREA, 1969
TONS/DAY

GRID	LAND AREA(Sq.Mi.)	SOX			PART			CO			HC			NOX		
		S	W	A	S	W	A	S	W	A	S	W	A	S	W	A
1	2471.0	0.0	0.0	0.0	0.1	0.1	0.1	3.1	2.4	2.7	0.6	0.5	0.5	0.3	0.3	0.3
2	617.7	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
3	617.7	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
4	617.7	0.1	0.1	0.1	0.2	0.1	0.1	7.7	6.1	6.6	1.4	1.2	1.3	0.7	0.7	0.7
5	617.7	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.4	0.4	0.1	0.1	0.1	0.1	0.0	0.0
6	617.7	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	617.7	0.0	0.0	0.0	0.1	0.1	0.1	4.3	3.4	3.8	0.8	0.7	0.7	0.4	0.4	0.4
8	2471.0	0.1	0.1	0.1	0.7	0.7	0.7	12.6	10.7	11.4	1.9	1.6	1.7	0.9	0.8	0.8
9	617.7	0.2	0.2	0.2	0.5	0.5	0.5	27.8	22.0	24.1	4.6	3.7	4.0	2.1	2.0	2.0
10	617.7	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0
11	617.7	0.0	0.0	0.0	0.1	0.1	0.1	4.4	3.5	3.8	0.8	0.6	0.7	0.4	0.4	0.4
12	617.7	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0
13	617.7	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.3	0.1	0.1	0.1	0.0	0.1	0.0
14	617.7	0.2	0.2	0.2	4.6	4.6	4.6	51.1	45.7	47.6	6.9	6.1	6.4	2.8	2.7	2.7
15	617.7	603.0	603.0	603.0	0.5	0.5	0.5	2.5	2.0	2.2	0.5	0.5	0.5	0.3	0.3	0.3
16	617.7	0.0	0.0	0.0	0.1	0.1	0.1	3.1	2.4	2.7	0.6	0.5	0.5	0.3	0.3	0.3
17	617.7	0.0	0.0	0.0	0.1	0.1	0.1	4.0	3.2	3.5	0.8	0.6	0.7	0.4	0.4	0.4
18	617.7	0.1	0.1	0.1	0.2	0.1	0.1	7.4	5.9	6.4	1.4	1.1	1.2	0.8	0.6	0.7
19	617.7	0.1	0.0	0.1	0.2	0.1	0.1	6.5	5.1	5.6	1.2	1.0	1.0	0.7	0.6	0.6
20	617.7	0.0	0.0	0.0	0.1	0.1	0.1	7.1	6.1	6.4	0.9	0.7	0.8	0.5	0.4	0.4
21	2471.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	617.7	0.0	0.0	0.0	0.1	0.1	0.1	4.0	3.1	3.4	0.7	0.6	0.6	0.4	0.3	0.4
23	617.7	0.2	0.1	0.1	0.4	0.4	0.4	19.4	15.4	16.8	3.5	2.9	3.1	1.7	1.8	1.6
24	617.7	0.0	0.0	0.0	0.1	0.1	0.1	4.9	3.8	4.2	0.9	0.7	0.8	0.5	0.4	0.4
25	617.7	0.4	0.4	0.4	4.7	4.7	4.7	69.5	55.1	60.2	10.8	8.9	9.6	4.5	4.1	4.1

TABLE 24 (Cont.)

26	617.7	0.1	0.1	0.1	0.5	0.5	0.5	7.5	6.0	6.5	1.5	1.2	1.3	9.5	9.3	9.2
27	617.7	0.0	0.0	0.0	0.0	0.0	0.0	2.8	2.2	2.4	0.5	0.4	0.4	0.3	0.2	0.2
28	617.7	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	617.7	0.0	0.0	0.0	0.0	0.0	0.0	1.5	1.2	1.3	0.3	0.2	0.3	0.2	0.2	0.2
30	617.7	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.2	0.1	0.1	0.1	0.0	0.0	0.0
31	617.7	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
32	38.6	0.1	0.1	0.1	0.1	0.1	0.1	6.8	5.3	5.8	1.3	1.0	1.1	0.7	0.6	0.6
33	38.6	0.0	0.0	0.0	1.8	1.8	1.8	4.4	3.8	4.0	1.1	1.0	1.0	0.5	0.4	0.5
34	38.6	0.0	0.0	0.0	0.4	0.4	0.4	2.4	2.4	2.4	0.8	0.8	0.8	0.3	0.3	0.3
35	38.6	0.0	0.0	0.0	0.1	0.1	0.1	1.8	1.4	1.6	0.4	0.3	0.4	0.2	0.2	0.2
36	617.7	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.8	0.9	0.2	0.2	0.2	0.1	0.1	0.1
37	2471.0	0.0	0.0	0.0	0.0	0.1	0.0	0.5	0.4	0.4	0.1	0.1	0.1	0.1	0.2	0.1
38	38.6	0.0	0.0	0.0	0.0	0.0	0.0	1.9	1.5	1.7	0.4	0.3	0.3	0.2	0.2	0.2
39	38.6	0.1	0.1	0.1	0.4	0.4	0.4	13.2	10.4	11.4	2.5	2.0	2.2	1.4	1.2	1.2
40	38.6	0.6	0.5	0.5	27.4	27.3	27.3	77.1	61.6	67.2	12.6	10.4	11.2	5.7	5.6	5.4
41	38.6	0.0	0.0	0.0	0.1	0.1	0.1	2.5	2.0	2.1	0.4	0.4	0.4	0.2	0.2	0.2
42	38.6	353.4	353.3	353.4	3.6	3.5	3.5	47.3	37.3	40.9	7.5	6.1	6.6	7.0	6.8	6.7
43	38.6	25.3	25.1	25.2	39.0	38.8	38.8	519.6	471.7	489.0	52.8	33.6	42.5	18.6	17.6	17.5
44	38.6	0.4	0.3	0.4	1.1	1.1	1.0	70.7	55.8	61.2	9.8	8.0	8.7	3.9	4.1	3.8
45	38.6	0.2	0.2	0.2	0.6	0.6	0.6	31.3	24.8	27.1	5.3	4.3	4.7	2.4	2.5	2.3
46	154.4	0.0	0.0	0.0	0.1	0.1	0.1	2.9	2.3	2.5	0.6	0.5	0.6	0.3	0.4	0.3
47	154.4	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0
48	154.4	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3	0.4	0.1	0.1	0.1	0.0	0.0	0.0
49	2471.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	1.3	1.4	0.3	0.2	0.3	0.2	0.1	0.1

EMISSION DENSITIES

In order to provide a visual representation of the emissions of pollutants by grids, emission density maps have been prepared. Emission densities were obtained by summing the annual area and point source emissions for each grid and dividing this total by the land area of the giid. Figures 6 through 10 show the variation in emission densities for the respective grids throughout the Study Area. As expected the emissions generally follow the pattern and degree of urbanization. Emission densities for carbon monoxide and hydrocarbons are higher in the grids with the higher populations and corresponding higher vehicular activity.

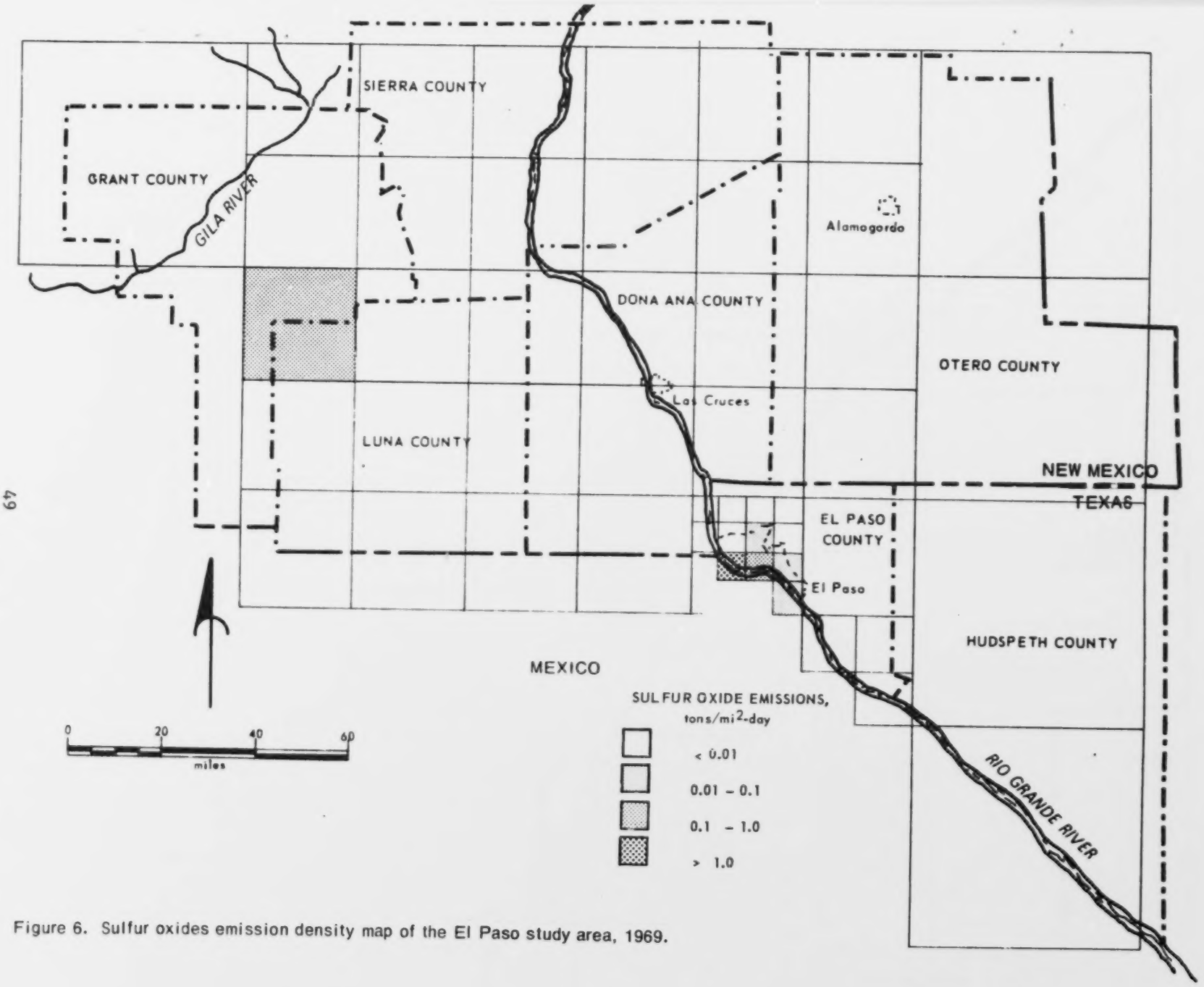

Figure 6. Sulfur oxides emission density map of the El Paso study area, 1969.

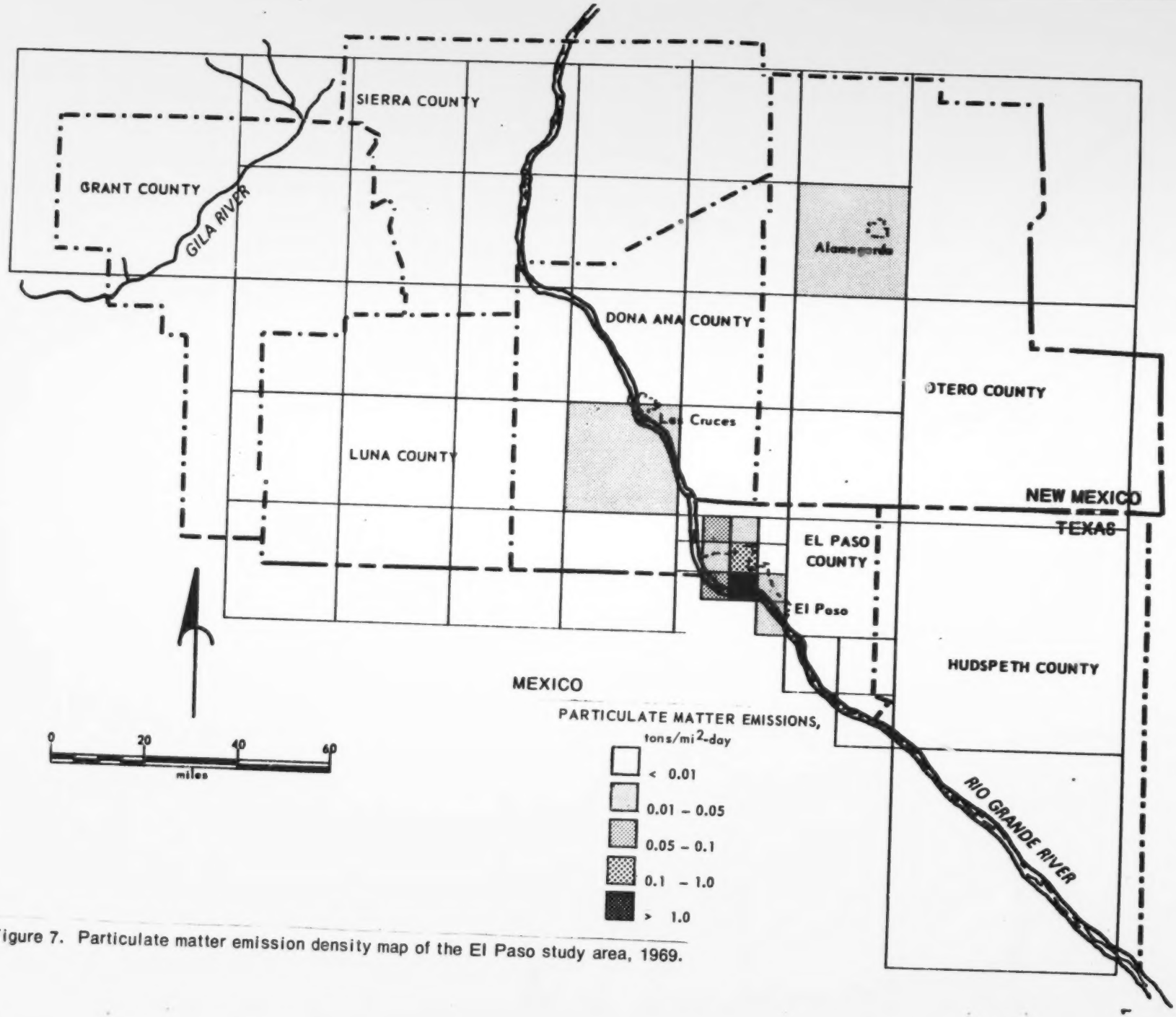

Figure 7. Particulate matter emission density map of the El Paso study area, 1969.

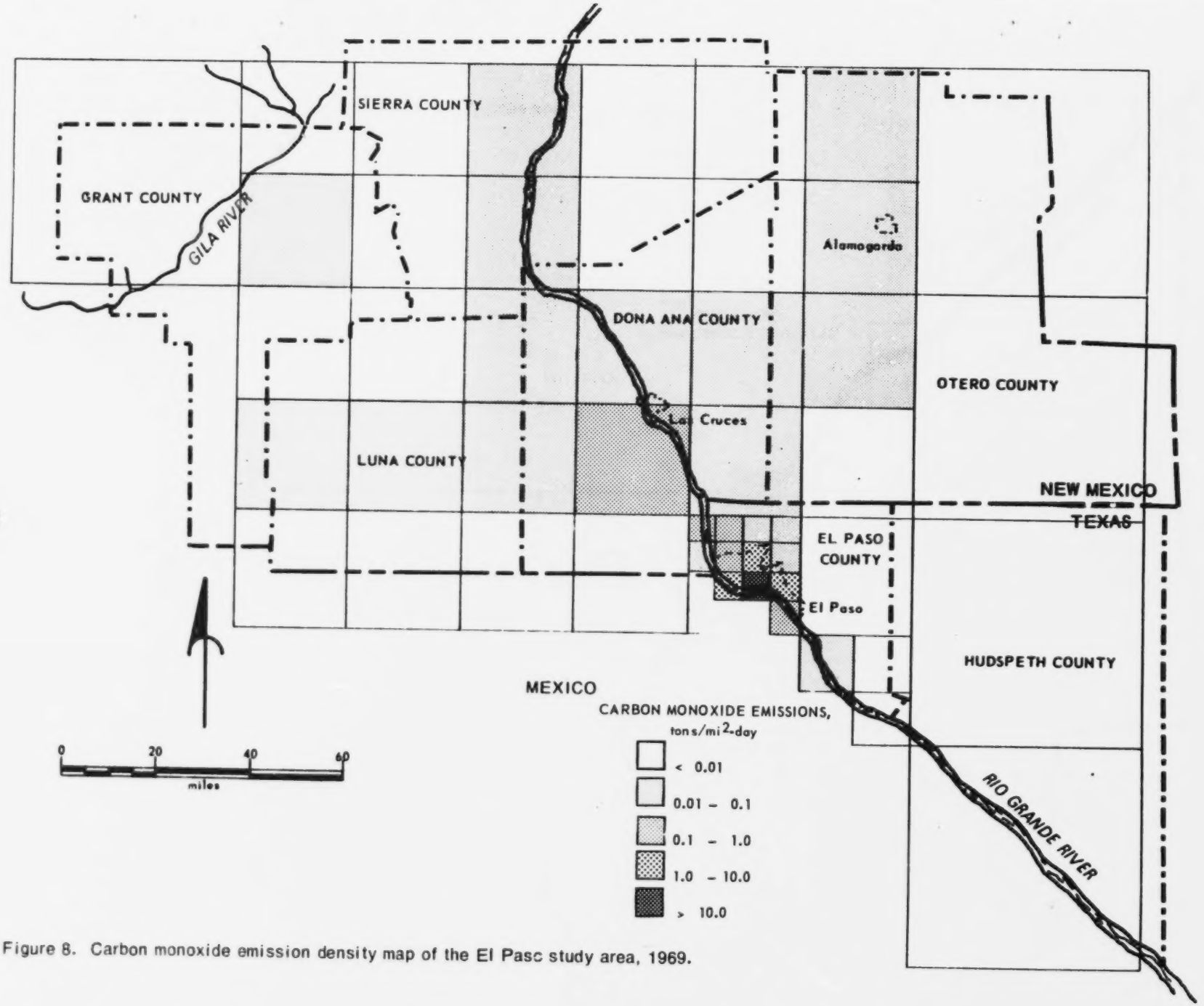

Figure 8. Carbon monoxide emission density map of the El Paso study area, 1969.

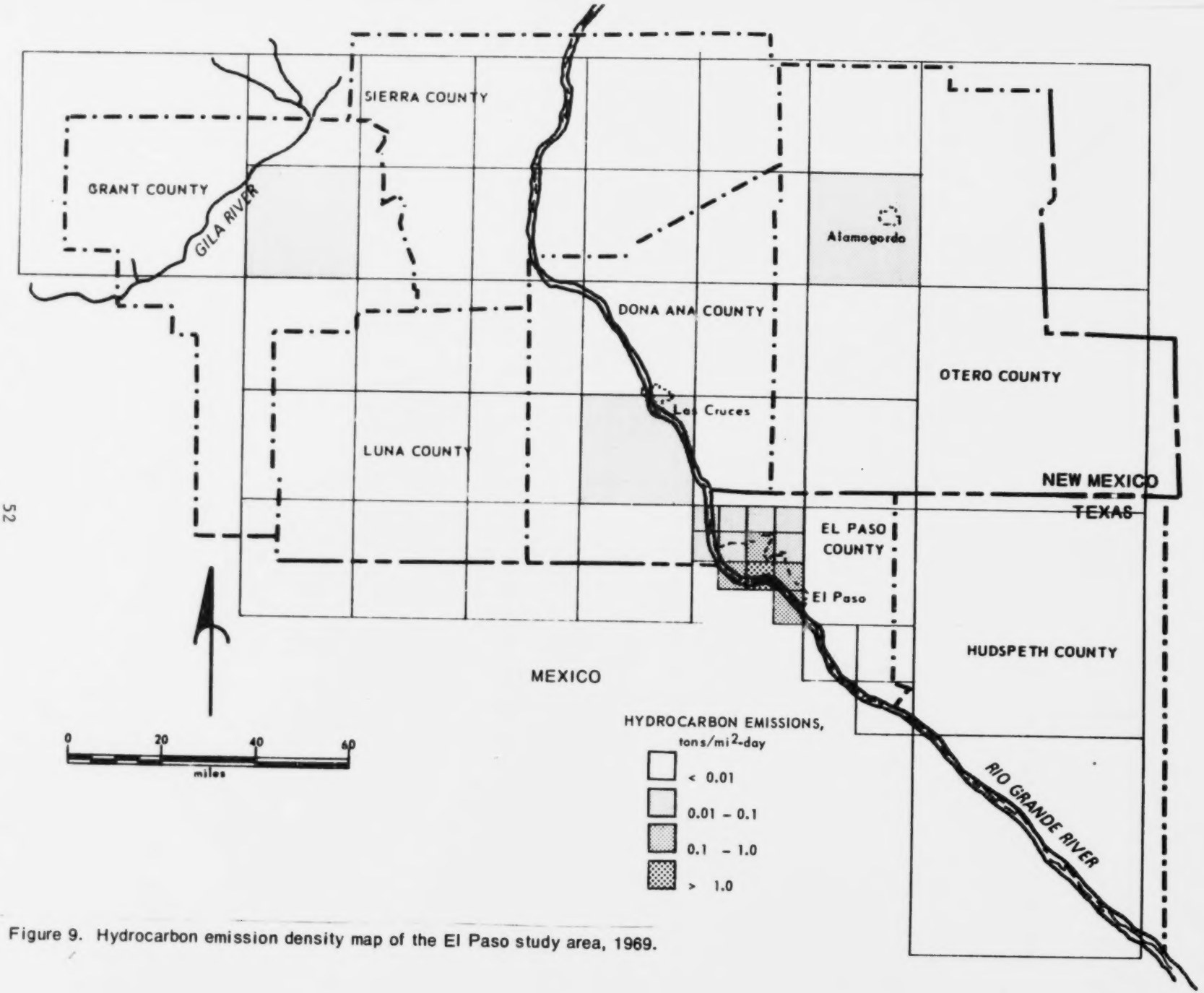

Figure 9. Hydrocarbon emission density map of the El Paso study area, 1969.

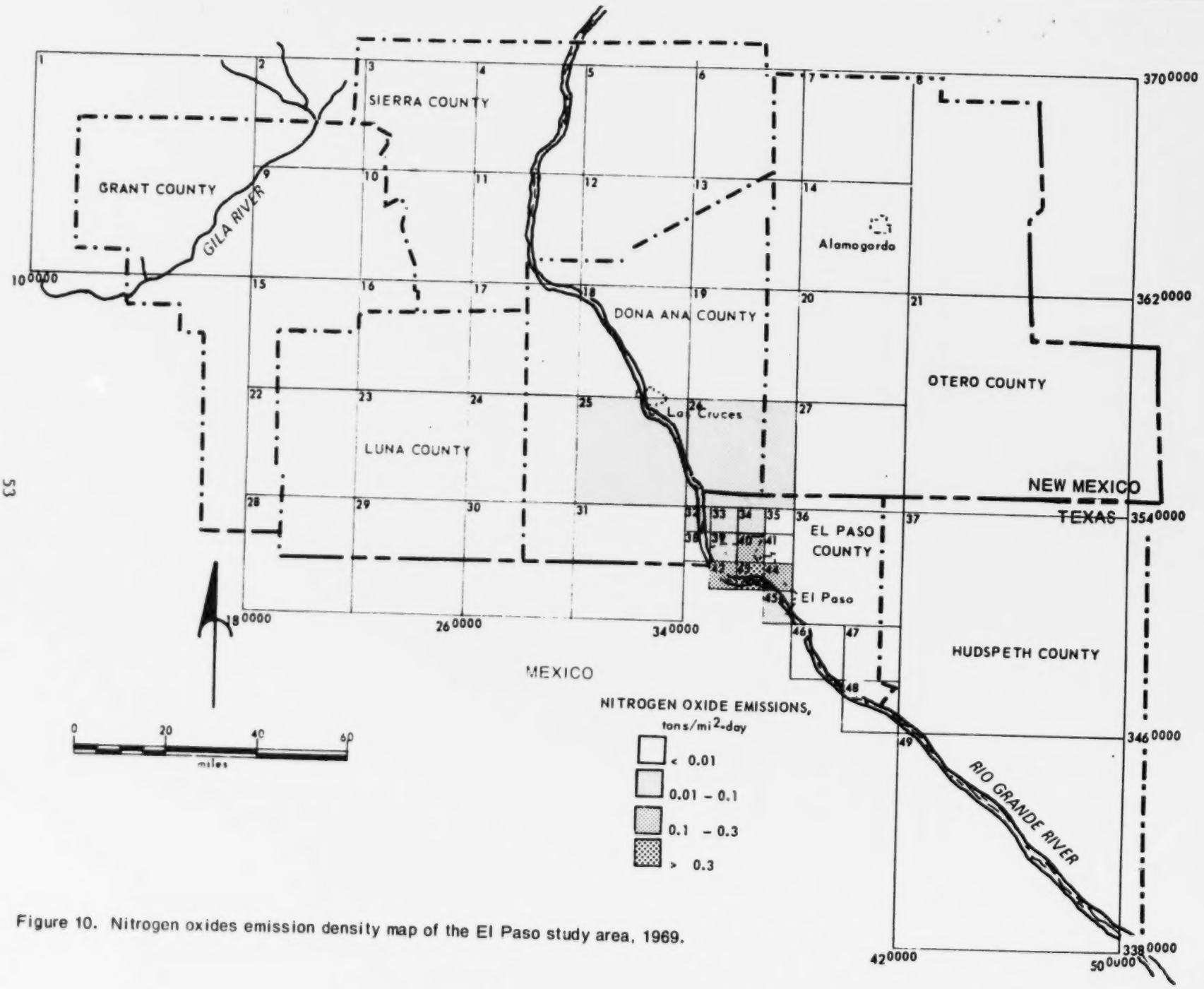

Figure 10. Nitrogen oxides emission density map of the El Paso study area, 1969.

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1. Ozolins, Guntis and Raymond Smith, Rapid Survey Technique for Estimating Community Air Pollution Emissions, DHEW, PHS, October 1966.

2. Duprey, R. L., Compilation of Air Pollutant Emission Factors, United States, DHEW, PHS, 1968.

3. County and City Data Book 1967, United States Department of Commerce, April, 1967.

4. El Paso Transportation Study, Volume 1, 1963-1985, Texas Highway Department.

5. Duprey, op. cit., p. 46.

APPENDIX

METHOD FOR CALCULATING SUMMER, WINTER AND ANNUAL AVERAGE EMISSIONS FOR FUEL CONSUMPTION IN STATIONARY SOURCES

YEARLY AVERAGE (A)

$$A = \frac{\text{Fuel Consumed} \times \text{Emission Factor (E. F.)}}{\text{Days of Operation}}$$

e.g. A plant consumed 100,000 tons of coal in 1967 while operating 365 days. The total degree days for the area was 4,800 and 2,800 for the three winter months. The plant was estimated to use 15 percent of the fuel for space heating and 85 percent for process heating. From this information, the annual average emission for carbon monoxide would be the following:

$$A = \frac{100{,}000 \text{ Tons/year} \times 3 \text{ lbs. CO/Ton coal}}{365 \text{ Days/year} \times 2{,}000 \text{ lb./Ton}}$$

$$A = 0.41 \text{ Ton/Day}$$

WINTER AVERAGE (W)

$$W = \frac{\text{Fuel Consumed} \times \text{E.F.}}{\text{Days of Winter Operation}} \times \frac{\text{Winter Degree Days}}{\text{Total Degree Days}} \times \text{\% Fuel Used for space heating}$$

$$+ \frac{\text{Fuel Consumed} \times \text{E.F.}}{365} \times \text{\% Fuel used for process heating}$$

$$W = \left[\frac{100{,}000 \times 2{,}800}{90 \times 4{,}800} \times 0.15 + \frac{100{,}000}{365} \times 0.85\right] \frac{3}{2{,}000}$$

$$W = 0.49 \text{ Ton/Day}$$

SUMMER AVERAGE (S)

$$S = \frac{\text{Fuel Consumed} \times \text{E.F.}}{\text{Days of Summer Operation}} \times \frac{\text{Summer Degree Days}}{\text{Total Degree Days}} \times \text{\% Fuel Used for space heating}$$

$$+ \frac{\text{Fuel Consumed} \times \text{E.F.}}{365} \times \text{\% Fuel used for process heating}$$

$$S = \left[\frac{100{,}000}{90} \times \frac{0}{4{,}800} \times 0.15 + \frac{100{,}000}{365} \times 0.85\right] \frac{3}{2{,}000}$$

$$S = 0.35 \text{ Ton/Day}$$